

REMARKS

This amendment is in response to the Office Action mailed May 22, 2009. Claim 17 has been cancelled. Claims 1, 16, 18 and 19 have been amended. Claims 1, 4-10, 12-16 and 18-34 are currently pending.

§103 Rejections

Claims 1, 4, 5, 7-10, 12-15, 27, and 29-34 were rejected under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 6,309,370 to Ben Haim et al. (hereinafter "Ben Haim") in view of U.S. Patent No. 5,947,905 to Hadjicostis et al. (hereinafter "Hadjicostis") and further in view of U.S. Patent Application Publication No. 2005/0042424 to Frey et al. (hereinafter "Frey"). Claims 6 and 16-26 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ben Haim in view of Hadjicostis and Frey as applied to claim 5 and in further view of U.S. Patent No. 6,019,726 to Webb (hereinafter "Webb"). Claim 28 was rejected under 35 U.S.C. §103(a) as being unpatentable over Ben Haim in view of Hadjicostis and Frey as applied to claim 27 above and in further view of U.S. Patent No. 4,917,097 to Proudian et al. (hereinafter "Proudian"). The Applicants traverse these rejections.

Claim 1 recites an imaging apparatus comprising a sensor coupled to an imaging device within a lumen and positioned proximal to the imaging device, wherein the sensor comprises a conductive coil, a solid core around which the conductive coil is wrapped, and a solid, non-conductive material disposed over the sensor. Similarly, claim 16 recites an inner core around which is wrapped the sensor coil. Claim 32 recites that the sensor includes a conductive wire wrapped around a solid magnetic core. Additionally, claim 18 recites that the inner core is a solid magnetic core and claim 19 recites that the inner core is a high permeability core. In order to navigate tortuous vessels, the length of the transducer/sensor assembly may be reduced. An inner core within the coil compensates for the reduction of the magnetic flux density, which occurs when the length of the assembly is reduced. Thus, the inner core may be helpful in maintaining the effective sensor area, while shortening the assembly (*see* Pre-Grant Publication [0018]).

The Office Action relies on Ben Haim as teaching the sensor arrangement of claims 1, 16 and 32 (Office Action, p. 3). Ben Haim teaches a position sensor 32, which includes coils 34 but does not teach or suggest a solid core or an inner core around which the coils are wrapped (Ben Haim 12:10-24). Likewise, Webb teaches a reference coil 26 and a coil 28 but fails to teach or suggest a solid coil or an inner coil (Webb 4:41-61). None of Proudian, Hadjicostis or Frey disclose such an inner core or a magnetic core in a coil of a sensor. Accordingly, the present Office Action fails to establish a *prima facie* case for obviousness because a proper *prima facie* case of obviousness must address every element of each of the claims. For at least these reasons, claims 1, 16, 18, 19, and 32, as well as claims 4-10, 12-15, and 18-26 which depend therefrom, are patentable over the cited references. The Applicants respectfully request withdrawal of the rejections of these claims.

Claim 1 recites a solid non-conductive material disposed over the sensor and one or more traces formed over the sensor and disposed in the solid, non-conductive material. Claim 16 recites a sensor coil and a non-conductive layer of epoxy surrounding the sensor coil and first and second traces residing in the non-conductive layer of epoxy. Claim 27 recites a sensor and a non-conductive material surrounding the sensor and one or more conductive traces formed within the non-conductive material. The sensor of claims 1 and 27 and the sensor coil of claim 16 are configured to communicate with a medical positioning system.

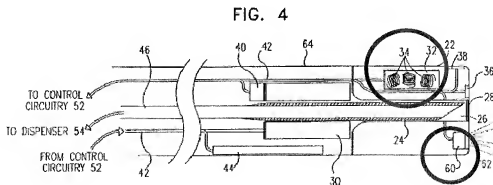
The Office Action asserts that the coils 34 of Ben Haim correspond to the recited sensor or sensor coil. Ben Haim does not teach or suggest a non-conductive material or non-conductive layer of epoxy surrounding the sensor. Moreover, Ben Haim does not teach or suggest traces that formed within, or residing within or disposed within, this non-conductive material.

The Office Action turns to Hadjicostis and asserts that “Hadjicostis et al. discloses an embodiment comprising a non-conductive material disposed over the conductive primary layer or core which comprises the circuit coils” (Office Action, p. 3-4). However, Hadjicostis does not teach such an arrangement. Hadjicostis does not appear to teach or suggest a “circuit coil” as asserted by the Office Action. The term “coil” does not appear in the text of Hadjicostis. The cited passage of

Hadjicostis merely states that a primary matching layer 80a may be bonded to a piezoelectric element 90a, which may be then bonded to flex circuit 20 (Hadjicostis 8:10-37). The piezoelectric element 90a is part of an array of piezoelectric transducer elements that are analogous to the imaging device described in the present claims. The piezoelectric element 90a is not part of a sensor or sensor coil configured to communicate with a medical positioning system. Thus, Hadjicostis only discusses modifying the transducer elements and not a sensor.

Likewise, Frey also discusses modifying matching layers that are used in ultrasonic transducer architectures (Frey, 1:5-8). Thus, both Frey and Hadjicostis are directed to the configurations of ultrasound transducers, not a sensor or sensor coil. Neither reference discusses the modification of a sensor or sensor coil. One of skill in the art would not turn to Hadjicostis or Frey to provide a modification of a sensor or sensor coil as asserted in the Office Action.

At best, Hadjicostis and Frey would inform one of skill in the art about how to prepare or modify the ultrasound transducer of Ben Haim. In Ben Haim, however, the ultrasound transducer 60 and coils 34 are separated from each other. Hadjicostis and Frey do not teach or suggest modification of a sensor or sensor coils and, therefore, one of skill in the art would not find it obvious to modify the coils of Ben Haim in view of Hadjicostis and Frey. Figure 4 of Ben Haim has been reproduced below as a courtesy to the Examiner with the transducer 60 and coils 34 circled for the purpose of illustration:



As can be appreciate from Figure 4 of Ben Haim, the ultrasound transducer 60 and the position sensor 32 are separate and distinct elements that are disposed apart from each other. Modifications to the transducer of Ben Haim in view of Hadjicostis or Frey would not provide a non-conductive material or non-conductive layer of epoxy around the coils of Ben Haim or produce traces in such a material or layer. There is no teaching or suggestion in Ben Haim that a modification to a transducer element can also be used as a modification to the sensor.

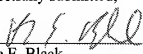
Thus, neither Hadjicostis, Frey, Ben Haim or any of the other cited references teach or suggest a non-conductive material or layer surrounding or disposed on a sensor or a sensor coil configured to communicate with a medical positioning system as recited in claims 1, 16 and 27. For at least these additional reasons, claims 1, 16, and 27, as well as the remainder of the claims which depend therefrom, are patentable over the cited references. Applicants respectfully request withdrawal of these rejections.

Claim 16 recites a drive shaft coil and a sensor coil disposed distal to the drive shaft coil. The Office Action relies on Webb as teaching the drive shaft coil of claim 16 (Office Action, p. 5). Webb, however, fails to identify the arrangement of a sensor coil that is distal to a drive shaft coil. Moreover, none of the cited references teach or suggest this specific spatial relationship between the sensor coil and the drive shaft coil recited in claim 16. For at least these additional reasons, claim 16, as well as claims 18-26 which depend therefrom, are patentable over the cited references. The Applicants respectfully request withdrawal of the rejections of these claims.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue. If the Examiner has any questions or concerns, the Applicants encourage the Examiner to contact the Applicants' representative, Bruce Black, by telephone to discuss the matter.

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Respectfully submitted,

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